
HATCHERY EVALUATION REPORT

Sawtooth Hatchery - Summer Steelhead

September 1996

Integrated Hatchery Operations Team (IHOT)

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An Independent Audit Based on Integrated Hatchery Operations Team (IHOT) Performance Measures

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Executive Summary

This report presents the findings of the independent audit of the Sawtooth Hatchery - Summer Steelhead program. The hatchery is located along the upper Salmon River near Stanley, Idaho. The hatchery is used for adult collection, incubation, and rearing of spring chinook and adult collection, spawning, and incubation of summer steelhead.

The audit was conducted in 1996-1997 as part of a 2-year effort that will include 67 hatcheries and satellite facilities located on the Columbia and Snake River system in Idaho, Oregon, and Washington. The hatchery operating agencies include the U.S Fish and Wildlife Service, Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, and Washington Department of Fish and Wildlife.

Background

The audit is being conducted as a requirement of the Northwest Power Planning Council (NPPC) "Strategy for Salmon" and the Columbia River Basin Fish and Wildlife Program. Under the audit, the hatcheries are evaluated against policies and related performance measures developed by the Integrated Hatchery Operations Team (IHOT). IHOT is a multi-agency group established by the NPPC to direct the development of new basinwide standards for managing and operating fish hatcheries. The Bonneville Power Administration (BPA) contracted with Montgomery Watson to act as an independent contractor for the audit.

IHOT has established five basic policies that cover: (1) hatchery coordination, (2) hatchery performance standards, (3) fish health, (4) ecological interaction, and (5) genetics. The audit focuses on all these policies, with the exception of hatchery coordination. These policies are set forth in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries (IHOT 1995)*. That document is the source for the performance measures that are the basis of this audit.

The Audit Process

The audit was based on the facility management's response to a 109-page questionnaire. This audit form was completed through a five-step process in which:

- Information was obtained from headquarters.
- The hatchery manager was asked to fill out and return the audit form.
- A 1-2 day site audit visit was conducted to inspect facilities, review hatchery records, discuss audit form responses, and develop remedial action plans.
- A compliance report was developed to document the compliance status of each performance measure. This report was then shared with the hatchery manager and IHOT representative.
- This hatchery evaluation report was written to document compliance with IHOT performance measures and develop cost estimates for remedial actions when needed.

Sawtooth Hatchery - Summer Steelhead Results

The Sawtooth facility includes 3 adult holding pond, 28 concrete raceways, 12 outside early rearing raceways, 16 indoor early rearing vats, and incubation facilities. The Sawtooth Hatchery was constructed in 1984-85 as part of the Lower Snake River Compensation Plan (LSRCP) - a program to mitigate for anadromous fishery losses caused by the construction of four hydroelectric dams on the lower Snake River.

The Sawtooth Hatchery was in general compliance with most of the performance measures. In the area of program objectives, the hatchery was not meeting its adult return goal and needed to document its adult contribution. The audit found that the hatchery was not in compliance with the water temperature criteria, water quality monitoring requirements, and needed to develop specific incubation standards for the IHOT Operations Plan, all of which are facilities requirements. The hatchery needed to develop an approved Genetics Monitoring and Evaluation Program.

The specific areas in which the Sawtooth Hatchery - Summer Steelhead program requires remedial actions based on the IHOT performance measures are listed below. These remedial actions are listed in alphabetical order without intent of ranking or otherwise assigning priority:

- Develop approved genetics monitoring and evaluation program
- Develop specific incubation standards for IHOT Operations Plan
- Document adult contribution
- Determine quality of smolt produced for on station releases
- Document density and loading during acclimation
- Review IHOT temperature criteria
- Run analysis for contaminants
- Run analysis for missing water chemistry parameters
- Develop smoltification criteria and measure
- Document disease condition prior to release
- Document release number
- Document size at release
- Document release date
- Provide rearing in the subbasin
- Review release strategy as it relates to overall program

Non-compliance issues resulting from items beyond human control or Performance Measures not relevant to this hatchery (Type 1 in Table 3, Section 4 of this report) were not listed above.

Facility Description

Name:	Sawtooth Hatchery
Stock/Species:	Spring Chinook Summer Steelhead
Operating Agency:	Idaho Department of Fish and Game
Funding Agency:	Lower Snake River Compensation Program
Location:	Located along the upper Salmon River near Stanley, Idaho. It is approximately 879 river miles from the mouth of the Columbia River at an elevation of 6,480 feet above sea level.
Address:	Idaho Department of Fish and Game Sawtooth Fish Hatchery HC 64, Box 9905 Stanley, ID 83278
Hatchery Manager:	Mr. Brent Snider
Phone:	(208) 774-3684
Fax:	
Purpose:	The Sawtooth Hatchery was constructed in 1984-85 as part of the Lower Snake River Compensation Plan (LSRCP) - a program to mitigate for anadromous fishery losses caused by the construction of four hydroelectric dams on the lower Snake River. The LSRCP mitigation goal is to return 19,445 spring chinook adults above Lower Granite Dam.
Production Goal:	Spring Chinook Produce 1.6 million smolts (80,000 lb) for on-station release Produce 700,000 smolts (35,000 lb) for release into the East Fork Salmon River. Summer Steelhead Trap and spawn adult steelhead to provide eggs to other hatcheries for LSRCP programs Release 741,000 smolts (from Hagerman NFH) to provide broodstock

and sport fisheries.

Water Supply:

Water is supplied to the hatchery by gravity flow from the Salmon River and also pumped from three wells. The hatchery uses 15,709 gpm of water from the river and wells produce 4,039 gpm for incubation and early rearing.

Facilities:

Adult Holding:	3 adult holding ponds - 10,200 cf each
Incubation:	100 stacks of vertical tray incubators (800 trays)
Early Rearing:	12 indoor rearing vats -391 cf each 12 outdoor fry raceways - 1395 cf each
Raceways:	28 raceways - 5,400 cf each
Rearing Ponds:	none
Satellite Facilities:	East Fork Salmon River Satellite 3 adult holding ponds and a spawning area.

Section 3

Compliance Status

The hatchery audits are based on compliance with written IHOT performance measures. These performance measures are documented in *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries* (referred to as *IHOT 1995* in this report).¹ The purpose of the performance measures is to implement new basinwide policies that provide regional guidelines for operating anadromous hatcheries in the Columbia Basin.

The audit focuses on performance measures for IHOT policies that cover (1) hatchery performance standards, (2) fish health, (3) ecological interaction, and (4) genetics. These performance measures are intended to guide hatchery operations once production is established. For that reason, the hatchery operations audit included broodstock collection, spawning, incubation of eggs, fish rearing and feeding, fish release, equipment maintenance and operations, and personnel training. Production priorities are beyond the scope of this audit.

Based on *IHOT 1995*, a detailed 109-page audit form was developed. The audit form divided the performance measures into six major sections along major program and technical criteria areas. Two additional sections (sections 1 and 8) include general information and expenditure information needed for this Hatchery Evaluation Report and blank forms for additional comments. The following is the basic structure of the IHOT audit form:

Section 1	Performance Measures for General Information and Expenditure Information (PMs General 1-2)
Section 2	Performance Measures for Program Objectives (PMs 1-4)
Section 3	Performance Measures for Facility Requirements (PMs 5-15)
Section 4	Performance Measures for Hatchery Practices (PMs 16-25)
Section 5	Performance Measures for Fish Health Policy (PMs 26-34)
Section 6	Performance Measures for Ecological Interactions (PMs 35-38)
Section 7	Performance Measures for Genetics Policy (PMs 39-43)
Section 8	Blank Forms for Additional Comments

Several performance measures are repeated in various sections of the audit form. These performance measures overlap in *IHOT 1995* and were retained to allow individuals interested in specific portions of the audit (such as Genetics or Fish Health) to determine the compliance status of all performance measures for a given topic in one location. A repeated performance measure is indicated by shaded text.

The Hatchery Audit Process

The hatchery audit will be conducted over a 2-year period that concludes in 1997. At each hatchery, a five-step process was used to complete the overall hatchery audit. This process consisted of research and onsite visits. The site visit at the Sawtooth Hatchery was conducted on September 12, 1996.

¹Integrated Hatchery Operations Team (IHOT) 1995. *Policies and Procedures for Columbia Basin Anadromous Salmonid Hatcheries*, Bonneville Power Administration, Portland, Oregon.

The following is the five-step audit process:

1. Information was obtained from headquarters.
2. The hatchery manager was asked to fill out and return the **Audit Form**.
3. A 1-2 day site audit visit was conducted at each hatchery. During that visit an audit team inspected facilities, reviewed hatchery records, discussed audit form responses, and developed remedial action plans when appropriate.
4. During the site visit, the compliance status of each performance measure was discussed with the hatchery manager and IHOT representative. A portion of the Hatchery Evaluation Report was sent to the hatchery manager following the audit visit as a **Compliance Report**. That Compliance Report is Table 2 of this report.
5. Information from steps 1-4 was used to prepare a draft **Hatchery Evaluation Report**. This draft report was submitted to the operating agencies for review of the information used to determine compliance. Based on review and comments, a final Hatchery Evaluation Report was developed. The final report documents the compliance of a particular hatchery with the IHOT performance measures and presents cost estimates to correct any deficiencies.

Compliance Status of Sawtooth Hatchery - Summer Steelhead

The following table includes information on life-stages that are held on this facility for some portion of their rearing cycle (Table 1). For multi-facility programs, summary cost and contribution data is presented at the facility where rearing occurs. For the compliance status relating to performance measures that do not occur at this hatchery, please refer to the Hatchery Evaluation Reports for the hatcheries and stocks listed in Table 1. A check mark (✓) indicates that the specific life stage is held at this facility.

This section documents the compliance status of the Sawtooth Hatchery - Summer Steelhead program. Each performance measure is presented in a table taken from the audit form (Table 2). The compliance status is identified by the following categories:

- **N/A** (not applicable)
- **Yes** (in compliance)
- **?** (unknown; generally due to unavailability of information to determine compliance)
- **No** (not in compliance).

Remedial actions are suggested for performance measures not in compliance. These remedial actions are grouped into categories and listed in Section 4 of this report, where the cost of the required remedial actions is also presented.

Table 1 Summary Program Information for Sawtooth Hatchery - Summer Steelhead (“A” Run)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Sawtooth Hatchery ^(a)	Hagerman NFH ^(a)	Pahsimeroi Hatchery ^(b)	Sawtooth Hatchery ^(b)	Niagara Hatchery ^(b)	
Adult Collection	✓		✓			
Adult Holding	✓		✓			
Spawning	✓		✓			
Fertilization	✓		✓			
Incubation						
green-to-eyed	✓			✓		
eyed-to-hatch		✓			✓	
Rearing						
fry		✓			✓	
fingerlings		✓			✓	
smolts		✓			✓	
Release	✓		✓			

(a) Typical A Run program at Sawtooth

(b) Backup supplier of eggs for Sawtooth Hatchery when program is short.

Table 1 (Continued) Summary Program Information for Sawtooth Hatchery - Summer Steelhead ("B" Run)

Component	Location of Adult Holding, Spawning, Incubation, and Rearing					
	Slate Creek - temporary weir	East Fork Satellite	Sawtooth Hatchery	Magic Valley Hatchery		
Adult Collection	✓	✓				
Adult Holding		✓				
Spawning		✓				
Fertilization		✓				
Incubation						
green-to-eyed			✓			
eyed-to-hatch				✓		
Rearing						
fry				✓		
fingerlings				✓		
smolts				✓		
Release (no acclimation)	✓	✓				

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
the hatchery programs outlined in a subbasin management plan?		✓			Columbia Basin System Planning Production Plan, LSRCP, IDFG 5-Year Plan, and NMFS Biological Opinion	
the hatchery operating under a current hatchery operational plan?		✓			IHOT Operations Plan and Hatchery Operations and Maintenance Plan	
Is it understood by staff?		✓				
Is it being followed?		✓				
Is hatchery monitoring and evaluation plan in place?					LSRCP Fish Hatchery Evaluation - Idaho	
Do you have a written monitoring and evaluation plan?		✓				
Adult contribution to fisheries, spawning grounds, and hatchery			✓		Only have partial information on Idaho returns	Document adult returns
Adult pre-spawning survival as compared with established goal		✓			Review of records; in compliance 5 out of last 5 years	
Adult take as compared with established hatchery goal				✓	Review of records; in compliance 0 out of last 5 years	Improve adult returns
Smolt-to-egg to eyed-egg survival as compared with established goal		✓			Review of records; in compliance 4 out of last 4 years	
Smolt-to-egg to fry survival as compared with established goal	✓				No eyed eggs at this hatchery	
Smolt to smolt survival as compared with established goal	✓				No fry at this hatchery	
Production as compared with established goal	✓				No releases at this hatchery	
Percent survival (smolt to adult) as compared with established goal	✓				Reported at Hagerman NFH (A Run) or Magic Valley (B Run)	
Number of eggs, fry, fingerlings, smolts, and/or adults meet basinwide needs	✓				Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Temperature						
Does your water temperature meet the criteria for spawning?		✓			Review of records/Discussion	Review IHOT temperature criteria
Does your water temperature meet the criteria for incubation?				✓	Review of records/Discussion. Too low; 40°F at start.	
Does your water temperature meet the criteria for rearing?	✓				No rearing at this hatchery	
Dissolved gases						
Is the oxygen level near saturation?		✓			Review of records/Discussion	
Is the dissolved nitrogen level less than saturation?		✓			Review of records/Discussion	
Chemistry						
Ammonia (un-ionized)			✓		No data	Run analysis
Carbon Dioxide			✓		No data	Run analysis
Chlorine			✓		No data	Run analysis
pH		✓			Review of records/Discussion	
Copper			✓		No data	Run analysis
Hydrogen Sulfide			✓		No data	Run analysis
Iron			✓		No data	Run analysis
Manganese			✓		No data	Run analysis
Turbidity						
Does your turbidity meet the criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alkalinity and hardness						
Does your alkalinity and hardness meet the criteria?		✓			Review of records/Discussion	
Nitrite						
Does your nitrite meet the criteria?		✓			Review of records/Discussion	
Pesticide Contaminants						
Aldrin			✓		No data	Run analysis for contaminants
Dieldrin			✓			
Endrin			✓			
Heptachlor			✓			
Chlordane			✓			
Methoxychlor			✓			
Permethrin			✓			
Malathion			✓			
Parathion			✓			
Pathogens						
What portions of the hatchery have disease-free water?						
Adult holding		✓		✓	Inspection of facilities/ Discussion Inspection of facilities/ Discussion No rearing at this hatchery No rearing at this hatchery	
Incubation		✓				
Early rearing	✓					
Rearing	✓					
Others						

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Alarm Systems						
Do the following areas have alarms?						
Intake		✓			Inspection of facilities/ Discussion	
Large rearing ponds and adult holding ponds		✓			Inspection of facilities/ Discussion	
Raceway headboxes and rearing ponds		✓			Inspection of facilities/ Discussion	
Incubation facilities		✓			Inspection of facilities/ Discussion	
Quarantine areas and facilities	✓				Inspection of facilities/ Discussion	
Water treatment systems		✓			Inspection of facilities/ Discussion	
Security				✓	Not a problem at this hatchery	None
Are there outside systems and buzzers in on-site residences?		✓			Discussion	
Are water flow alarms checked daily?		✓			Review of records/Discussion	
Are all other alarms checked weekly?		✓			Discussion	
Is there a log of alarms for emergencies, tests, and maintenance requirements?		✓			Review of records/Discussion	
Are telephone pagers used?		✓			Discussion	
Egg collection and holding facilities						
Do you meet the adult holding criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Incubation facilities Type 1: Vertical Stack Incubators Do you have an adequate number of units for the overall program?		✓			Inspection of facilities/Discussion	
Rearing facilities Type 1: Inside Vats Do you have an adequate number of units for the overall program? Type 2: Small Outside Raceways Do you have an adequate number of units for the overall program? Type 3: Raceways Do you have an adequate number of units for the overall program?	✓ ✓ ✓				No rearing this program. No rearing this program. No rearing this program.	
Screening facilities Do you meet the approach velocity criteria? Are the fish screens regularly cleaned? Does the screen mesh meet screen opening criteria? Are rearing containers double screened for fish that should not be released to adjacent water?	✓ ✓ ✓ ✓				Program on well water/screening not applicable See above See above Any releases are to adjacent waters.	
Predator control facilities Are your predation control facilities effective?		✓			Discussion/Inspection	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
d storage facilities and quality control						
Does the storage of dry/semi-moist/moist foods (dry<12%; semi-moist 12-20%; moist >20% moisture) follow food manufacturer's recommendations?	✓				Program does not involve feeding	
Does a regional quality control officer oversee production procedures and monitor:	✓					
Verification by feed manufacturer that ingredients meet specifications?	✓					
Ensure feed does not contain unwanted drugs or other additives?	✓					
Analyze ingredients contained in the final food product to ensure that feed specifications have been met?	✓					
Are the foods stored and handled according to the following criteria?	✓					
Moist pellets should not exceed 10 °F at point of delivery.	✓					
Moist pellets should be removed from freezer just prior to feeding.	✓					
Do not leave buckets of feed or feed containers outside exposed to light or heat.	✓					
Open bags of feed should be fed within 1 to 2 days except when feeding small groups of fish.	✓					
Automatic feeder hoppers and bulk storage facilities should be insulated against excessive temperatures (80°F and above).	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Release facilities						
Do the release facilities ensure that fish are not subjected to adverse conditions?		✓			Discussion/Inspection	
Pollution abatement facilities						
Do the pollution abatement facilities meet all federal and state regulations (or good engineering practice)?	✓				No feeding in this program. Pollution abatement facilities audit results reported for spring chinook	
Are pollution abatement facilities operated correctly?	✓					
Transportation facilities						
Are the transport systems adequate to meet IHOT performance measures for transportation practices?	✓				Hagerman NFH and Magic Valley Hatchery transport smolts	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Broodstock selection practices						
Is the donor selection process document attached?	✓				Existing program; does not apply	
Was the donor selection outline followed in selecting the hatchery broodstock?	✓				Existing program; does not apply	
to PM #40 in Genetics Section						
Spawning practices						
Were the appropriate number of spawners, male/female ratios, and fertilization protocols used?		✓				
to PM #42 in Genetics Section						
Incubation practices						
Are specific incubation standards listed in the hatchery operations plan?		✓			Reviewed Hatchery Operations and Maintenance Manual	Develop specific incubation standards for IHOT Operations Plan
Are incubation practices written?		✓				
Incubation Type 1: <u>Vertical Stack</u> (see PM #8) you meet the loading and flow criteria?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Rearing practices						
specific rearing standards listed in the hatchery rearing plan?	✓				No rearing at this hatchery	
rearing practices written?	✓					
Rearing Unit Type 1: Indoor Vats (see PM #9)						
Do you meet the density and DI criteria?	✓					
Do you meet the Loading and FI criteria?	✓					
Rearing Unit Type 2: Small Outdoor Raceways (see #9)						
Do you meet the density and DI criteria?	✓					
Do you meet the Loading and FI criteria?	✓					
Rearing Unit Type 3: Raceways (see PM #9)						
Do you meet the density and DI criteria?			✓		Used for acclimation of A Run	Document density and loading during acclimation
Do you meet the Loading and FI criteria?			✓		No data provided	
Smolt quality						
Do you produce a high quality smolt?			✓		No information provided for A Run. N/A for B Run.	Determine quality of smolt produced for on-station releases.

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Health management practices						
Are the monthly hatchery monitoring visits being conducted? (PM #26)		✓			Review of records/Discussion	
Are the annual broodstock inspections being conducted? (PM #27)		✓			Review of records/Discussion	
Is there pathogen-free water and are the sanitation procedures being followed? (PM #28)		✓			Review of records/Discussion	
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature				✓	Review of records/Discussion	Review IHOT temperature criteria
Dissolved gases		✓			Review of records/Discussion	
Chemistry			✓		Review of records/Discussion	Run analysis for missing chemistry parameters
Turbidity		✓			Review of records/Discussion	
Alkalinity and hardness		✓			Review of records/Discussion	
Nitrite		✓			Review of records/Discussion	
Contaminants			✓		Review of records/Discussion	Run analysis for contaminants
Are rearing standards being followed? (PM #19)			✓		Review of records/Discussion	See PM #19
Are egg and fish transfer/release requirements met? (PM #31)		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do hatchery performance meet requirements defined in the regional hatchery policies and in the basin and hatchery plans for the following areas?</p> <p>Percent smoltification</p> <p>Do you measure percent smoltification?</p> <p>Did you meet the smoltification criteria?</p>				<p>✓</p>	<p>PM #22 answers relate to A Run smolts reared at Hagerman and released at Sawtooth</p> <p>Discussion</p> <p>Not measured, uncertain</p>	<p>Develop smoltification criteria and measure</p>
<p>Rearing density (prior to release)</p> <p>Did you meet the rearing density criteria just prior to release?</p>			✓		No information	See PM #19
<p>Disease condition (at release)</p> <p>Did you meet all disease regulations just prior to release?</p>			✓		No information	Document disease condition prior to release
<p>Release number (at release)</p> <p>Did you meet the release number goal?</p>			✓		No information	Document release number
<p>Size at release</p> <p>Did you meet the size goal?</p>			✓		No information	Document size at release
<p>Release date</p> <p>Did you meet the release date goal?</p>			✓		No information	Document release date
<p>Location of release</p> <p>Did you release the fish at the specified location?</p>		✓			Released on station	
<p>Rearing location</p> <p>Are the fish reared in the subbasin?</p> <p>Are the fish acclimated in the subbasin?</p>	✓	✓		✓	<p>Reared at Hagerman</p> <p>Acclimated on station</p>	Provide rearing in the subbasin
<p>Release strategy appropriate for the program?</p>			✓		Review of records	Review release strategy as it relates to overall program

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Do transportation equipment and personnel receive disinfection before and after use?	✓				Transportation done by Hagerman NFH and Magic Valley Hatchery	
Is the fish tank interior disinfected using a solution of 100 ppm active chlorine for 30 minutes minimum or formaldehyde gas generation method (relative humidity of 60% for 2 hrs)?	✓					
Is the exterior of the fish transport vehicle disinfected using high pressure steam (115-130°C), high temperature acid, or with 200 ppm chlorine for 30 minutes?	✓					
Is the fish transport vehicle (cab) disinfected using 600 ppm quaternary ammonia compounds (1.5 ml of 50% stock solution/liter water)?	✓					
Is other equipment disinfected including fish pumps, nets, egg sorters, waders, boots, rain gear, hoses and other equipment using one of the following solutions?		✓			Discussion	
200 ppm chlorine for 30 minutes 600 ppm quaternary ammonia compound for 30 minutes 200 ppm iodophor solution for 10 minutes		✓			Discussion	
Do personnel wear protective garments when handling fish eggs or cultural water?		✓			Discussion	
Do the fish transport truck/chassis and tank/unit receive an inspection and service prior to the release season?	✓					
Is a daily service inspection completed before starting work and leaving for the day?	✓					

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Transportation facilities						
Does the fish transport unit receive an inspection prior to loading?	✓				Sawtooth Hatchery personnel do not transport smolts	
Does a pre-loading inspection covering: tank water level, pumps or aerators, oxygen injection system settings, displacement gauge, and truck loading/hauling density tables checked and reviewed occur prior to loading fish in the transport unit?	✓					
Do hauling criteria include checking the fish 45 minutes to 1 hour after loading ?	✓					
When fish are active and systems are functioning properly, is the oxygen concentration reduced and maintained at approximately 8 ppm?	✓					
Is water temperature in the transportation unit maintained within the 42-48 °F range?	✓					
Do fish releasing procedures include the following criteria?						
Releasing the fish at the correct release site or into the correct water body.		✓			Discussion	
Tempering or the difference between the liberation tank and the target water body should not exceed 10°F.		✓			Discussion	
The liberation hose should be angled so that fish gently hit the water. Using a tripod is a method of ensuring the hose will stay at the proper angle.		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Evaluation practices						
Has the hatchery conducted fishery contribution studies?						
Determine the requirements for evaluating and improving management programs?		✓			Discussion	
Develop guidelines that define the geographical area and identify component stocks (hatchery and/or wild) that comprise the management unit?		✓			Discussion	
Develop guidelines that define if the proper stocks of fish are currently being used?		✓			Discussion	
Determine which management units contribute to a specific fishery and the time periods of those contributions?		✓			Discussion	
Determine the relative contributions of the various management units to a specific fishery over the different time periods?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
ining practices						
Does the hatchery have a training schedule for its staff?		✓			Review of records/Discussion	
Does each staff member have a personal training plan approved by a supervisor and reviewed annually?		✓			Review of records/Discussion	
Does the hatchery routinely exchange training details between other hatcheries and agencies?		✓			Review of records/Discussion	
Does the hatchery encourage and reward off-duty training of staff?		✓			Review of records/Discussion	
Does the hatchery conduct monthly staff meetings?		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
monthly hatchery monitoring visits being conducted by a qualified fish health specialist as described below? Conduct visit at least monthly Monitoring conducted by qualified fish health specialist Examine a representative sample of healthy and moribund fish from each lot. Review fish culture practices with hatchery manager. Report finding and results of necropsies on standard form. Recommend appropriate drug or chemical treatment. Summarize fish health status or stock prior to release or transfer to another facility.		✓ ✓ ✓ ✓ ✓ ✓			Review of records/Discussion Review of records/Discussion Review of records/Discussion Review of records/Discussion Review of records/Discussion Review of records/Discussion	
all of the functions of the hatchery yearly monitoring visits being completed as described below? Annually examine each broodstock for the presence of reportable viral pathogens. Annually screen each salmon broodstock for the presence of <i>Renibacterium salmoninarum</i> . Conduct inspection by or under the supervision of qualified fish health specialist.		✓ ✓ ✓			Review of records/Discussion Review of records/Discussion Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Are hatchery sanitation procedures following accepted sanitation procedures?						
Are there any sources of pathogen-free water, especially for incubation and early rearing?		✓			Discussion	
Are the hatchery sanitation procedures understood and being followed as described below?						
Disinfect/water harden eggs in iodophor?		✓			Inspection of facilities/ Discussion	
Are foot baths containing disinfectant placed at the incubation facility's entrance and exit?		✓			Inspection of facilities/ Discussion	
Is equipment and rain gear utilized in broodstock handling or spawning sanitized prior to its use elsewhere in the hatchery?		✓			Inspection of facilities/ Discussion	
Is equipment used to collect dead fish sanitized prior its use in another pond and/or lot of fish?		✓			Inspection of facilities/ Discussion	
Is equipment, including vehicles used to transfer fish between facilities, disinfected prior to use with any other fish lots or at any other location?		✓			Inspection of facilities/ Discussion	
Are rearing vessels sanitized after fish are removed and prior to introducing a new fish lot or stock?		✓			Inspection of facilities/ Discussion	
Are dead fish properly disposed of?		✓			Inspection of facilities/ Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
water quality parameters being followed?						
Are the following water quality parameters within criteria? (PM #5a-5h)						
Water temperature		✓		✓	Review of records/Discussion	See PM #5a
Dissolved gases		✓			Review of records/Discussion	Run analysis for missing parameters
Chemistry		✓	✓		Review of records/Discussion	
Turbidity		✓			Review of records/Discussion	
Alkalinity and hardness		✓			Review of records/Discussion	
Nitrite		✓			Review of records/Discussion	
Contaminants			✓		Review of records/Discussion	Run analysis for contaminants
io to PM #21						
incubation and rearing standards being followed?						
Are the incubation practices following the IHOT incubation criteria? (PM #18)		✓			Review of records/Discussion	
Are the rearing practices following the IHOT criteria? (PM #19)			✓		Review of records/Discussion	See PM #19
io to rearing practices PM #18-PM #19						
egg and fish transfer/release requirements met?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the hatchery's program outlined in a subbasin management plan?</p> <p>Go to subbasin plan PM #1</p>		✓			Columbia Basin System Planning Production Plan, LSRCP, IDFG Five Year Plan, and NMFS Biological Opinion	
<p>Is the hatchery operating under a current hatchery operational plan?</p> <p>Go to operational plan PM #2</p>		✓			IHOT Operations Plan and Hatchery Operations and Maintenance Plan	
<p>Is hatchery monitoring and evaluation plan in place?</p> <p>Go to hatchery monitoring and evaluation plan PM #3</p>		✓			LSRCP Fish Hatchery Evaluation - Idaho	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Does the hatchery program meet requirements established in the regional hatchery policies and basin planning documents in the following areas: species, stock, broodstock collection location, broodstock numbers, broodstock collection strategy, spawning and egg-take protocols?						
Does the hatchery program meet the requirements for the following?						
Species protocols (PM #4a)		✓			Review of records/Discussion	
Stock protocols (PM #4a)		✓			Review of records/Discussion	
Broodstock collection location protocols (PM #41)		✓			Review of records/Discussion	
Broodstock numbers protocols (PM #42)				✓	Too few adults	Improve adult returns
Broodstock collection strategy protocols (PM #41)		✓			Review of records/Discussion	
Spawning protocols (PM #42)		✓				
Egg-take protocols (PM #42)		✓			Review of records/Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Do the hatchery's performance meet requirements defined in the regional hatchery policies and in the subbasin and hatchery plans for the following areas:</p> <p>Percent smoltification, rearing density, disease condition, and the number, size date(s), and location of release?</p>						
Percent smoltification (PM #22a1)				✓	Review of records	See PM #22a1
Rearing density (PM #22a2)			✓		No data	See PM #22a2
Disease condition (PM #22a3)			✓		"	See PM #22a3
Number at release (PM #22a4)			✓		"	See PM #22a4
Size at release (PM #22a5)			✓		"	See PM #22a5
Date of release (PM #22a6)			✓		"	See PM #22a6
Location of release (PM #22a7)		✓			Released on station	
<p>Are fish reared in the subbasin or acclimated in the subbasin?</p> <p>PM #22b</p>				✓	Not reared in subbasin; but are acclimated	See PM #22b
<p>Is the release strategy appropriate for the program?</p> <p>PM #22c</p>			✓		Review of records	See PM #22c

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
new programs, has a broodstock collection plan developed?						
Is the broodstock collection plan written?	✓				Existing Program; does not apply	
For a non-captive broodstock program:	✓				Existing Program; does not apply	
Was an unbiased, representative sample collected?						
Was the recommended number of broodstock collected?	✓				Existing Program; does not apply	
For a captive broodstock program:						
Were captive brood progeny excluded as donors for propagating the next generation of the captive broodstock program?	✓				Existing Program; does not apply	
Were full-sib crosses avoided?	✓				Existing Program; does not apply	
Is the broodstock collection plan understood and being followed by staff?	✓				Existing Program; does not apply	
a new program, was the donor selection outline followed in selecting the hatchery broodstock?						
Is a donor selection plan written?	✓				Existing Program; does not apply	
Was the donor selection outline followed in selecting the broodstock?	✓				Existing Program; does not apply	
Was the target stock recommended in the donor selection process actually used?	✓				Existing Program; does not apply	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
existing programs, were the broodstock collection cedures followed?						
Is the broodstock collection plan written?		✓			Review broodstock collection plan	
Does the broodstock collection plan follow the guideline:						
Was an unbiased, representative sample collected?		✓			Discussion	
Was the recommended number of broodstock collected?				✓	Discussion	Improve adult returns
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	
Were the broodstock collection procedures in hatchery operation plan understood and followed?		✓			Discussion	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
<p>Is the appropriate number of spawners, male/female ratio, and fertilization protocols used?</p> <p>Are the spawning protocols written?</p> <p>Are daily or weekly spawning logs available?</p> <p>Was the appropriate number of spawners used?</p> <p>Did you attempt to spawn all collected broodstock and randomize mating with respect to age class, and other traits?</p> <p>Was the sex-ratio within the limits given in the performance standards?</p> <p>Were the fertilization protocols followed?</p> <p>If the hatchery needed to reduce the number of eggs retained, was this done by representative sampling of each male/female cross?</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>			<p>Review of spawning protocols</p> <p>Review of records</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p> <p>Discussion</p>	

Description of Performance Measure	Compliance Status				Basis for Compliance or Non-Compliance	Remedial Action Needed for Compliance
	N/A	Yes	?	No		
Where a genetics monitoring and evaluation program is available?				✓	None supplied to team	Develop approved genetics monitoring and evaluation program
Does the plan address the following elements listed in HOT:						
Does the program have elements needed to meet evaluation goals 1-4?	✓				Discussion	
Has a qualified geneticist reviewed and endorsed the program (goal 5)?	✓				Discussion	
Will the program collect the data and maintain the records needed to evaluate compliance on an ongoing basis (goal 5)?	✓				Discussion	
Is the program understood and followed by staff?	✓				Discussion	

Section 4

Remedial Actions

Based on the compliance status for each performance measure, remedial actions were developed. The required remedial actions are organized into five categories. The types of categories range across a spectrum from those actions that are beyond human control, to those that require a change in agency policy or procedures, to those that involve a significant capital cost to put in place. The following are the five types of remedial actions identified under phase 1 of the audit:

The Five Types of Remedial Actions

Type	Description
1	Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery
2	Remedial actions requiring changes in agency policies or procedures
3	Remedial actions requiring changes in monitoring coverage or interval
4	Remedial actions requiring significant capital expenditures
5	Remedial actions that may require significant capital expenditures but are not clearly definable at this time

Remedial Actions at Sawtooth Hatchery - Summer Steelhead

This section presents the corrective actions required to bring the Sawtooth Hatchery - Summer Steelhead program into compliance with IHOT performance measures. The remedial actions suggested here are just that, suggestions developed by the Montgomery Watson Audit Team. For some non-compliance areas, other remedial actions could be proposed. The required remedial actions are cross-referenced to each IHOT performance measure that was not in compliance. Where appropriate, the costs associated with the remedial actions are also presented (Table 3).

The cost estimates presented in this section are based on professional experience from similar projects. In most cases, only a lump-sum figure is presented, and detailed take-off lists have not been prepared. The cost estimates are essentially order of magnitude estimates ($\pm 40\%$).

More importantly, the suggested remedial activities may also present several levels of action. Optional actions have been listed for several problems. These optional actions are desirable for either operational or safety considerations.

Table 3. Remedial Actions Required at Sawtooth Hatchery - Summer Steelhead

Remedial Action Required	Cost	PMs¹
Type 1 - Non-compliance issues resulting from items beyond human control or Performance Measures not relevant for this hatchery		
Improve adult returns	----	4c, 35
Type 2 - Remedial actions requiring changes in agency policies or procedures		
Document adult contribution	----	4a
Review IHOT temperature criteria		5a
Develop specific incubation standards for IHOT Operations Plan	----	18
Document density and loading during acclimation	----	19
Determine quality of smolt produced for on station releases	----	20
Develop smoltification criteria and measure		22a1
Document disease condition prior to release		22a3
Document release number		22a4
Document size at release		22a5
Document release date		22a6
Provide rearing in the subbasin		22b
Review release strategy as it relates to overall program		22c
Develop approved genetics monitoring and evaluation program		43
Type 3 - Remedial actions requiring changes in monitoring coverage or interval		
Run analysis for missing water chemistry parameters	----	5c
Run analysis for contaminants	----	5g
Type 4 - Remedial actions requiring significant capital expenditures		
None	----	
Type 5 - Remedial actions that may require significant capital expenditures but are not clearly definable at this time		
None	----	

¹ PMs are performance measures that were extracted from the IHOT 1995 report. The IHOT performance measures are listed in Table 2 (Section 3 of this report) in numerical order.

Hatchery Contribution to Fisheries, Spawning Grounds, and Hatcheries

This section presents the audit findings for the Sawtooth Hatchery - Summer Steelhead contribution of adult fish to fisheries, local fisheries, spawning grounds, and hatcheries. Data is reported by broodyear. A broodyear refers to the adult contribution from the eggs produced from a single group of spawning adults. For some species, this may include fish caught as 2-, 3-, 4-, 5-, and 6-year old fish. Because of the return distribution and data processing delays, the complete adult contribution for a given broodyear may not be available until 4 to 5 years after the fish have been released from the hatchery.

**Table 4. Adult Contribution to Fisheries, Spawning Grounds, and Hatcheries:
Sawtooth Hatchery - Summer Steelhead¹**

Year	Fisheries ² (Broodyear)	Spawning Grounds ¹ (Broodyear)	Hatchery ¹ (Broodyear)	Total Combined Contribution ³ (Broodyear)	Smolt to Adult Survival (percent)
1981					
1982					
1983					
1984					
1985					
1986					
1987					
1988					
1989					
1990	1849	628	253		---
1991	1618	661	207		---
1992	503	54	125		---

¹ Fisheries contribution from Idaho only; no tribal harvest, or harvest in Oregon or Washington.

² Data obtained from Missing Production Groups Annual Report or from the Regional Mark Information System database.

³ Total combined adult contribution; presented when it is not possible to subdivide the contribution into fisheries, spawning grounds, and hatchery contributions.

Annual Operating Expenditures

The level and detail of annual operating expenditures varies widely depending on hatchery, operating agency, and funding source. When provided, expenditures were presented in terms of personnel costs, operating costs (power, feed, supplies), capital costs, indirect costs charged to the federal government, third-party costs, and other costs. These cost components were summed to determine a total hatchery annual cost. Based on discussion with the hatchery manager, the percent of total hatchery costs allocated to a given program was estimated. The total hatchery costs and the percent of hatchery costs allocated to a given program were used to compute the cost of a given program. Table 5 shows the annual operating expenses for the Sawtooth Hatchery - Summer Steelhead program. For programs that occur at more than one facility (as shown on Table 1 in Section 3 of this report), the cost breakdown for the component(s) at each facility is presented in a separate tables (Table 5a).

Table 5. Annual Operating Expenses: Sawtooth Hatchery - Summer Steelhead

Hatchery	1994	1995	1996
1. Sawtooth Hatchery	\$290,770	\$119,942	\$78,845
2. Magic Valley Hatchery	?	?	?
3. Hagerman NFH	?	?	?
4. Niagara Springs Hatchery	?	?	?
5. Pahsimeroi Hatchery	?	?	?
Total Program Costs	\$290,770	\$119,942	\$78,845

The total expenditures for the Sawtooth Hatchery are presented in Table 6 by program. The detailed breakdown of program expenditures at this hatchery is presented in separate tables (Tables 6a and 6b).

Table 6. Annual Operating Expenses - Sawtooth Hatchery

Program	1994	1995	1996
1. Summer Steelhead	\$290,770	\$119,942	\$78,845
2. Spring Chinook	\$385,439	\$379,816	\$249,675
3.			
4.			
5.			
Total Hatchery Costs	\$676,209	\$499,758	\$328,520

Table 5a. Annual Operating Expenses: Sawtooth Hatchery - Summer Steelhead
Expenditure Occurring at Sawtooth Hatchery

Component	1994	1995	1996
Personnel Costs	\$214,873	\$232,218	\$166,108
Operational Costs	\$243,561	\$169,972	\$110,890
Capital Costs	\$133,880	\$27,970	\$18,303
Indirect Costs	\$83,895	\$69,598	\$51,522
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$676,209	\$499,758	\$328,520
Source of Funds			
LSRCP	100%	100%	100%
Program Production (lb)	---	---	---
Total Production (lb)	---	---	---
Program as Percent of Total	43%	24%	24%
Program Costs	\$290,770	\$119,942	\$78,845

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6a. Detailed Expenditures at Sawtooth Hatchery by Program

Summer Steelhead

Component	1994	1995	1996
Personnel Costs	\$214,873	\$232,218	\$166,108
Operational Costs	\$243,561	\$169,972	\$110,890
Capital Costs	\$133,880	\$27,970	\$18,303
Indirect Costs	\$83,895	\$69,598	\$51,522
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$676,209	\$499,758	\$328,520
Source of Funds	100%	100%	100%
Program Production (lb)	---	---	---
Total Production (lb)	---	---	---
Program as Percent of Total	43%	24%	24%
Program Costs	\$290,770	\$119,942	\$78,845

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.

Table 6b. Detailed Expenditures at Sawtooth Hatchery by Program**Spring Chinook**

Component	1994	1995	1996
Personnel Costs	\$214,873	\$232,218	\$166,108
Operational Costs	\$243,561	\$169,972	\$110,890
Capital Costs	\$133,880	\$27,970	\$18,303
Indirect Costs	\$83,895	\$69,598	\$51,522
Lumped Hatchery Costs ¹			
Lumped Third-Party Costs			
Total Hatchery Costs	\$676,209	\$499,758	\$328,520
Source of Funds	100%	100%	100%
Program Production (lb)	---	---	---
Total Production (lb)	---	---	---
Program as Percent of Total	57%	76%	76%
Program Costs	\$385,439	\$379,816	\$249,675

¹ When it was not possible to obtain a detailed cost breakdown from an agency or third party, the undivided costs were entered here.